The Impact of Bilingualism on Cognitive Functions Across Lifespan and in Brain Diseases

THE IMPACT OF BILINGUALISM ON COGNITIVE FUNCTIONS ACROSS LIFESPAN AND IN BRAIN DISEASES

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The last decades have witnessed fundamental changes in our understanding of both brain and language. In cognitive neuroscience, the static, localisationist view of a 1:1 correspondence between circumscribed brain areas and specific cognitive functions gave way to a dynamic interaction of multiple networks, in which the same function can be distributed among many areas while the same area can be part of different networks. In the neuroscience of language, the concept of language as an autonomous, informationally-encapsulated module, as advocated in the 1980s, has been superseded by the notion of widely distributed language-related brain networks, going well beyond the traditional language areas and interacting with other aspects of cognition as well as with motor functions.[1]

These advances in the neuroscience of language are of particular importance in developing our understanding of bilingualism. Firstly, we have come to realise that different languages of a multilingual person cannot be reduced to static representations in isolated brain areas but are subject to parallel activation, inhibition, switching, and monitoring within the same brain networks. Secondly, the tension between this parallel activation and a selective output necessary for successful communication constitutes a permanent training for frontal-executive functions. Accordingly, the cognitive effects of bilingualism transcend language itself, leading to a better performance on many executive tasks,[2] particularly those requiring inhibition and switching. In contrast, given the complex nature of a bilingual (or even multilingual) vocabulary leading to multiple interactions, lexical access in bilinguals tends to be slower.[3] These theoretical considerations are supported by converging empirical evidence comparing systematic performance of mono- and bilingual subjects on a range of cognitive tests, particularly on those involving frontal-executive functions. A better performance in the bilingual group has been documented across the lifespan, in young[4] as well as elderly[5] subjects. Bilinguals have been shown to develop dementia 4–6 years later than monolinguals[6] and to be twice as likely to recover their cognitive functions after stroke.[7] This suggests that bilinguals are able to build up a stronger 'cognitive reserve', offering some protection against cognitive ageing and the effects of different brain pathologies.

As the discussion at the EAN congress in Copenhagen, Denmark, showed, many questions such as the role of the age of acquisition remain open and will require further research. Traditionally, bilingualism research has focussed on what was considered to be its ideal case: early acquisition and perfect command of more than one language. In contrast, recent studies suggest that the effects of bilingualism are possibly even stronger in those who acquire a second language later in life.[5] Even a short intensive language course can improve attentional switching and the effect is maintained 9 months after in those who practice 5 hours per week or more.[8] Future studies will need to go beyond a simple comparison of monolinguals and bilinguals as distinct, dichotomous groups and determine the 'dose-response curve', linking language learning, knowledge, and use to their cognitive effects. This includes not only the beneficial effects of bilingualism but also its potential side effects, such as slower lexical access.[3]

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